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10/029,435	12/18/2001	William T. Chen	B-4361 619261-9	5304

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EXAMINER	
PADGETT, MARIANNE L	
ART UNIT	PAPER NUMBER
1762	

DATE MAILED: 01/05/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.	Applicant(s)
10/029,435	Chen et al
Examiner	**Group Art Unit**
M.L. Padgett	1762

—The MAILING DATE of this communication appears on the cover sheet beneath the correspondence address—

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, such period shall, by default, expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

☒ Responsive to communication(s) filed on 4/1/03 & 7/9/03.

☐ This action is **FINAL.**

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

☒ Claim(s) 1-20 is/are pending in the application.

Of the above claim(s) 18-19 & 20 is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 1-17 is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claim(s) _____ are subject to restriction or election requirement

Application Papers

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119 (a)-(d)

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119 (a)-(d).

☐ All ☐ Some* ☐ None of the:

☐ Certified copies of the priority documents have been received.

☐ Certified copies of the priority documents have been received in Application No. _____.

☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a))

*Certified copies not received: _____.

Attachment(s)

☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). 3 (4/1/03) ☐ Interview Summary, PTO-413

☒ Notice of Reference(s) Cited, PTO-892 ☐ Notice of Informal Patent Application, PTO-152

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948 ☐ Other _____

Office Action Summary

1. Applicant's election without traverse of Group I, claims 1-17 in Paper No. 5 of July 9, 2003 is acknowledged.

2. Claims 9-17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 9, "the polymer surface" (line 4) lacks any antecedent basis, as nowhere in independent claim 1 are polymers required to be employed, hence where this polymer surface resides is unclear.

Use of relative terms that lack clear metes and bounds in the claims, or in a definitive definition in the specification or cited relevant prior art, is vague and indefinite. In claim 10, see "fine-line." What range of sizes does "fine" encompass? As it presently written, unless metes and bounds can be shown defined and supported, any size lines will be considered to read on this claim language.

In claim 11, how does a "landless via" differ from a generic "via", i.e. what meaning does the modifier contribute?

In claim 14, what relationship "selectively plating..." has to the independent claim's "electrolessly plating" (line 9) is unclear. Does claim 14 further describe the limitation of claim 1, or are they totally different steps? As presently written the meaning is ambiguous and either option may be considered applicable.

Similarly, is the step of claim 15 separate from those discussed in claim 1, or does it further describe previous limitations? The lack of showing antecedence for anything except "the substrate surface", but using related phrasing, makes this claim meaning uncertain.

In claim 17, it is unclear how "a wafer" relates to claim 1, as there are no waters employed in the independent claim.

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1 and possibly 17 are rejected under 35 U.S.C. 102(b) as being anticipated by Gonsiorawski (5,011,567).

First the examiner notes that the substrate being plated may be any material, and that the "strippable coating" reads on any applied coating that can be removed, by any known means, whether it is ever removed or not. The ability to be stripped, i.e. removed, does not necessitate that action ever taking place.

Gonsiorawski teaches a Si substrate with a dielectric layer which is selectively patterned via laser removal, i.e. laser ablation, to expose regions to which conductors will be subsequently electrolessly plated (i.e. immersion plating). While Gonsiorawski teach that immersion etch steps may be employed

after laser removal, they further teach that when certain laser parameters are used no residual Si_2N_4 or SiO_2 are present, thus the etch steps are not needed, i.e. omitted, in which case the laser related surfaces may be considered selectively activated as claimed. Note that the conductive plating material is taught to not adhere to the dielectrics. Immersion plating techniques (electroless) are then used to metalize the exposed areas selectively, where known procedures are used, including first applying gold chloride (i.e. equivalent to seeding particles), then immersion Ni plating. See the abstract; Figures, esp. 3; Summary; column 4, lines 24-36 and 59- column 5, lines 19 and 41-51; column 6, lines 1-5$^+$; column 7, lines 3-49; column 8, lines 15-29; and column 9, lines 24-39.

Since Si substrates are involved, they may be considered equivalent to wafers, which are possibly intended to be the substrate in claim 1, as [0031] of the specification discusses "re-mapping" as a sequence of steps analogous to claim 1, claim 17 would appear to be read on, pending clarification of the relationship of wafer to claim 1.

5. Claims 1-3, 6-8 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wu et al (4,877,644) and (5,035,918) Vyas, in view of Gonsiorawski or Imura et al (4,659,587).

Wu et al teach selective plating of a metal substrate, where that metal substrate may be an electrical contact (column 1, lines 5-39, esp. 13-14 and 28-37). The examiner takes notice that such electrical contacts or terminals, are typically found on surfaces or in layers of integrated circuit boards. Wu applies a polymeric plating resist, such as styrene acrylic copolymers, then employs lasers ablation to pattern the resist. By choosing the energy density of the laser to be a value on the order of 30 J/cm^2, the surface characteristics of the metal in the expose area will also be effected, including effecting cleaning of the surface, which is considered equivalent to the claimed activating. The exposed metal may then be plated by immersion plating in a gold bath. See the abstract; figures; column 3, lines 7-13, 23-68; column 5, lines 1-35 and 50- column 6, lines 25 and 38-68; and claims 1-2, 5, 7, 10 and 12. Note that stamped electrical contacts imply a lack of planarity; or imply non-planar features.

Wu et al does not discuss the strippability of the resist (but as discussed above, that is irrelevant to the independent claim), nor discuss any plating (electroless) after the Au deposit. Vyas is cumulative to Wu et al (column 1, lines 6-15, cited as an improvement thereon), containing many of the same teachings, but more on polymer resist selection and less on laser parameters. Vyas also uses the styrene acrylic copolymer as the resists, and teaches stripping it off the substrate after plating. Note a particular taught motivation for using this technique to selectively plate electrical contacts, is to minimize expensive gold uses, by limiting deposition to the contact areas. In Vyas, see the abstract; column 1, lines 24-37and 54-68+; column 3, lines 1-68; Summary; column 4, line 65- column 5, line 42 and line 65- column 6, line 46 (see bridging sentence for substrate being a Ni-plated substrate, consistent with above notice) and column 6, line 65- column 7, line 4.

While Wu et al and Vyas do not electrolessly plate, their Au deposit with another metal, it would have been obvious for one of ordinary skill to do so, in order to form interconnects, as that is the purpose of electrical contacts when employed in articles such as circuit boards. Gonsiorawski (column 8, line 15-29) described above, provides teaching of $AuCl_2$ to be applied before immersion plating (electroless) of Ni for selectively masked /"activated" substrates, providing a known connecting metallization depositions consistent with the Wu et al/Vyas taught electrical contacts/terminals. Alternately, Imura et al teach electrolessly plating after laser selective activation (wet or dry), where the electroless coating may be in polyimide circuit boards already patterned with their conductive (Cu) films (abstract; Figures 6-10; column 3, lines 12-32 and 48-68; column 4, lines 20-68; column 5, lines 6-17; column 8, line 1- column 9, line 15). Once electroless plating has been selectively accomplished, it can be continued until desired thickness is obtained or alternatively electrolytic plating may be subsequently used (column 10, lines 39-50). Imura et al's background (column 1, lines 8-27 and column 2, lines 1-45) also indicates this use of noble metal catalyst followed by electroless plating technique is a conventional electroless plating technique, and employed in multi-layer wiring boards to make suitable connections. These secondary

references supply further means and motivation to one of ordinary skill in the art to apply further electroless plating solution to the Au immersion bath treated contacts of Wu et al/Vyas, as they demonstrate uses where contacts need to have connection made between them and the applied Au would have been expected to function as a seed layer as well as improving the contract's connection.

6. Claims 1-3, 5, 9, 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cole et al (EPO 260,514 B1), in view of Inoue (EPO 151,413 A2) and Vyas.

Cole et al teach electroless plating with metals, inclusive of Cu, Pd, Ni, etc, on substrates (may be non-planar have metal pads, etc), that may include polyimides, epoxies, silicone polyimides, polysulfones or silicone rubber, SiO_2, etc., or have a similar insulating surface layer, plus are coated with one or two removable layers, water and optional organic-soluble, either of which may be aromatic or non-aromatic. A laser is used to ablate a pattern in the soluble polymeric layer, or alternately through that layer and the insulating surface (4) on the substrate. A catalytic coating capable of instigating electroless coating is applied, then the electroless plating solution is contacted to the substrate, selectively plating the exposed areas, while washing away the soluble layers. This process may be for embedded metal pads in the substrate surface and be used to provide interconnections between circuit patterns. See column 1, lines 3-45 and 57- column 2, line 40; column 3, lines 20-40 and 54- column 4, line 58; and column 5, lines 1-20. While the expose area may be considered to have been activated by the laser ablation, the seed or catalyst layer differs by depositing over the entire surface, all materials, not just preferentially on the laser treated related areas. Exemplary energy fluence is taught as $\geq$ 20 mJ/cm, and Example 1 uses 12 pulses giving power density per pulse of about 2.4×10^6 W/cm^2 to ablate.

Inoue (EPO) discloses dielectric materials, such as acrylonitrite butadiene styrene, epoxy, silica, alumina, etc., that became activated when laser treated (Figures; page 1, Field...; page 3 summary; & page 23), where catalytic priming solution is applied thereto in preparation for electroless plating. On page 12 an exemplary laser uses 10 watts for a 0.6 cm diameter beam, thus .884 W/cm^2, which is a lesser

energy to activate than to achieve ablation as would have been expected. Thus Inoue is cumulative in demonstrating laser activation of substrate surface insulting materials, as employed by Cole et al (EPO), such that selective deposition of the catalyst can be achieved. Vyas (described above in section 4) provides alternative ablatable and strippable resist layers, i.e. the styrene copolymer which is consistent with Inoue's (EPO) teaching in that it does not adhere the catalyst material unless activated, but is an effective material to be using in this procedure. Therefore, it would have been obvious to one of ordinary skill in the art to use a resist layer as suggested by Vyas in Cole et al (EPO), in order to provide taught selective plating deposition, with strippable masks, because the Vyas resist material provides the advantage of minimizing use of expensive catalytic material (i.e. does not waste noble metal catalyst by depositing the resist), but continues to provide the advantages of using the resist when complex substrates may be involved. Also, the Vyas resist is consistent with options taught by Cole et al in column 5, where polystyrenes are among the possible resist materials.

7. Claims 6-8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cole et al (EPO), in view of Inoue and Vyas (EPO) as applied to claims 1, 5, 9 and14 above, and further in view of Imura et al (discussed in section 5).

The above combination does not discuss deposition of further metal, via electroless or electrolytic techniques, on the selectively deposited metal, but such would have been obvious in order to form desired thickness for particular devices, as shown by Imura et al in Example 4 on column 10, lines 39-50, where analogous end products are being provided via analogous laser activation procedures.

8. Claims 11-13 and 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cole et al (EPO), in view of Inoue and Vyas as applied to claims 1-3, 5, 9 and 14 above, and further in view of Burgess (6,211,485).

The above combination does not teach the specific structures of drilled via holes or integrated resistors between interconnections, however Burgess (abstract; Figures 1-7 & 10; column 1, lines 7-18;

Summary; claims, esp. 1, 4 and 16) shows that use of lasers to drill vias needed for interconnections, and the deposition of integrated resistors between such connections are known and advantageous on integrated circuit boards, such as being produced in the above combination, hence it would have been obvious to include such steps as taught by Burgess in the process of Cole et al in view of Vyas and Inoue to provide such known and desired features.

9. Other art of interest includes: Kuksaskis et al which is equivalent to Burgess for claim 15-16 for teaching plating resistors on circuit boards (abstract; column 5); Egitto et al who is equivalent and cumulative to Burgess for claim 11-13 showing the desirability of laser drilling to create via holes, especially the advantages of doing so when using a strippable mask that can remove any produced debris; Temple et al which has analogous teachings to Cole et al (EPO); and Ludden et al who teach the desirability of aromatic containing polymers to be employed for creating electronic microcircuits when laser ablation is to be used.

10. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cole et al, in view of Inoue and Vyas as applied to claims 1-3, 5, 9 and 14 above, and further in view of Ludden et al (5,487,852).

In the above combination, the strippable polymer is a styrene acrylic co-polymer, hence while it includes an aromatic, it also "comprises" a non-aromatic polymer, i.e. the acrylic. The insulating substrate materials used in Cole et al are generic categories, not indicating aromatic or not, however as taught some embodiments require laser ablation, hence use of a laser ablatable suggested dielectric, such as polyimides would have been required. Ludden et al provides examples of aromatic containing polyimides (abstract; column 2, lines 35-41; and column 4, lines 5-13), hence use of these in Cole et al would have been desirable to practice taught results.

11. Any inquiry concerning this communication from the examiner should be directed to M. L. Padgett whose telephone number is (571) 272-1425. The examiner can generally be reached on

Monday-Friday from about 8:30 a.m. to 4:30 p.m.; and fax phone numbers are (703) 872-9306 (all official).

M.L. Padgett/dh 12/30/03
October 27, 2003
December 16, 2003

MARIANNE PADGETT
PRIMARY EXAMINER